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(72) Inventors: Applicants are also the inventors.

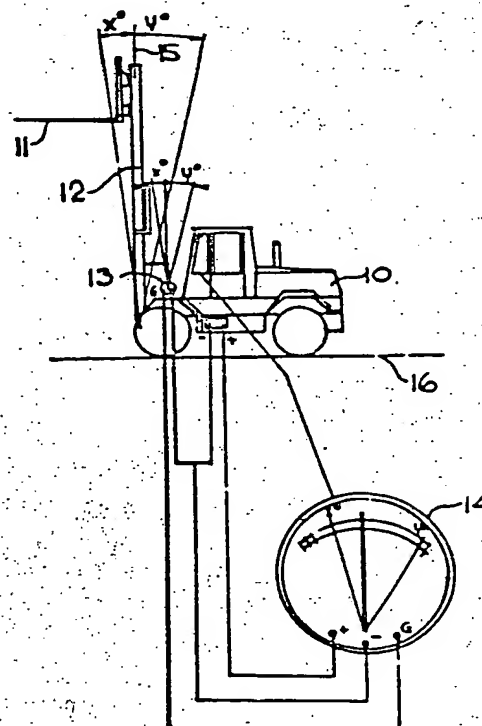
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Amended claims

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(54) Title: INCLINATION INDICATOR FOR GRIPPING MEANS ON LOADING MACHINES

## (57) Abstract

Inclination indicator (14) for loading machines (10) having gripping means (11, 20) which are adjustable to an arbitrary angle of inclination in relation to a reference plane (16). The gripping means (11, 20) can be for instance the fork (11) on a fork lift truck (10) or the clamping means (20) on a clamping lift truck (10). The purpose of this is to enable the driver of the loading machine (10) to adjust the inclination of the gripping means (11, 20) to a position which is most suitable for gripping or other handling of the goods (21).



Inclination indicator for gripping means on loading machines

The present invention relates to an inclination indicator for loading machines having gripping means which are adjustable to an arbitrary angle of inclination in relation to a reference plane, for instance the fork on a fork truck. The purpose of this is to enable the driver of the loading machine to adjust the inclination of the gripping means to a position which is most suitable for gripping the goods.

When loading piled goods as boards with a fork truck the fork is entered into spaces in the pile of goods. It is then important that the fork has the same inclination as the spaces, or otherwise the fork may damage the boards where it is entered.

When loading cylindrical objects as paper rolls with a clamping truck, the clamping means bearing on the cylindrical surface of the roll, it is important that the contact of the clamping means with the roll is parallel to the axis of the roll. If the clamping occurs at an angle to the axis the roll is damaged by the shearing in the outer layers of the roll which is caused when the roll during the continued clamping movement strives to turn towards a position where the axis of the roll is parallel to the clamping contact line.

In both these cases there is a great risk of damaging the goods because the inclination of the clamping means can not be judged with sufficient accuracy from the driver's seat.

The present invention solves this problem by means of an inclination indicator, suitably of an electronic type, consisting of a sensor, for instance a potentiometer, which detects the angular position of the fork in relation to a reference plane, for instance the plane defined by the supporting surfaces of the wheels, and a pointer which shows the position detected by the sensor.

The invention is described more in particular in the following specification with appended drawings showing the following:



Fig. 1 shows a fork lift truck with a fork for piece goods or piled goods and an inclination indicator according to the invention.

Fig. 2 shows a clamping truck with clamping means for gripping a paper roll or similar and an inclination indicator according to the invention. The figure shows the clamping means in their correct position.

Fig. 3 shows the same clamping truck as in Fig. 2 but with the clamping means in an incorrect position.

10 The truck 10 shown in Fig. 1 is in a known way provided with a fork 11 which is vertically adjustable on a lifting frame 12. The fork is placed at  $90^\circ$  angle to the frame. The frame can be inclined to different angles and in the figure an inclination forwards is marked  $x^\circ$  and an inclination rear-  
15 wards is marked  $y^\circ$ . The angles are related to the line 15 which is perpendicular to the plane 16 of the ground. When the lifting frame is inclined a certain angle forwards or rearwards the fork 11 is inclined by the same angle downwards respectively upwards in relation to the plane 16 of  
20 the ground, the plane 16 thus being the reference plane for the inclination of the fork.

The inclination of the frame and the fork is detected by the sensor 13 and registered on the pointer device 14, so that the truck driver can adjust the fork to the desired  
25 position. The horizontal position is used when the fork is entered between the boards in a pile, an inclination upwards is used in order to prevent the goods from sliding off, and an inclination downwards is used for unloading.

Figs. 2 and 3 show another type of loading machine, a truck  
30 with a clamping device for gripping objects. In the illustrated case the clamping device has two clamping arms 20 adapted to grip on opposite sides of a paper roll 21 placed with its axis vertically. Fig. 2 shows the clamping device adjusted to the correct angular position so that the clamping contact surfaces of the clamping arms are parallel to  
35 the axis of the paper roll and thus bear on the surface of the roll. Fig. 3 shows an incorrect angle of the gripping

device, which results in a point contact between the clamping surfaces and the paper roll, with subsequent damage on the roll at the contact points.

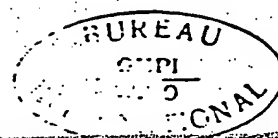
5 In the described examples it is assumed that the ground is the reference plane. In case the truck stands on a sloping ground the indicator will thus register the inclination in relation to the sloping plane. If instead it is desired to register a horizontal position independently of the possible inclination of the truck, this can be achieved by means of  
10 a plummet device to which the indicator is related.

In the examples described it is shown how the angular position of the gripping means is adjusted by changing the position of the lifting frame in relation to the truck. Naturally this adjustment can also be made by making the  
15 gripping means angularly adjustable in relation to the lifting frame.



Claims

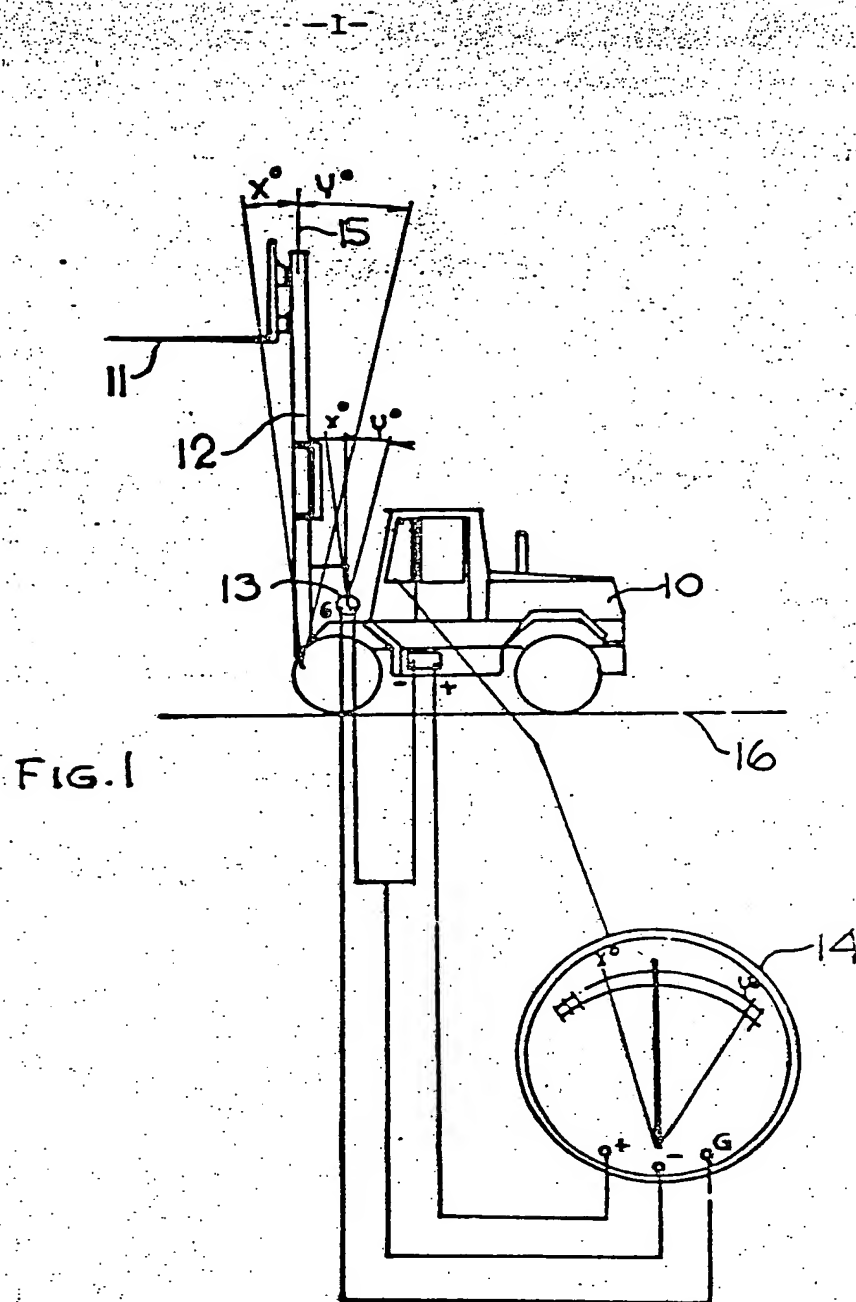
1. Inclination indicator for loading machines having gripping means which are adjustable to an arbitrary angle of inclination in relation to a reference plane, characterized in that the indicator comprises a sensor (13) adapted to  
5 detect the inclination of the gripping means (11,20) in relation to the reference plane (16) and a pointer device (14) connected to said sensor (13) and adapted to show said inclination at a place visible to the truck driver.
2. Indicator as defined in claim 1, characterized in that  
10 the reference plane (16) is the ground.
3. Indicator as defined in claim 1, characterized in that the reference plane is a horizontal plane.
4. Indicator as defined in any preceding claim, characterized in that the gripping means are vertically adjust-  
15 able.
5. Indicator as defined in any preceding claim, characterized in that the gripping means are a fork.
6. Indicator as defined in any of claims 1 to 4, characterized in that the gripping means are a clamping device.
- 20 7. Indicator as defined in any preceding claim, characterized in that the device is electronic.

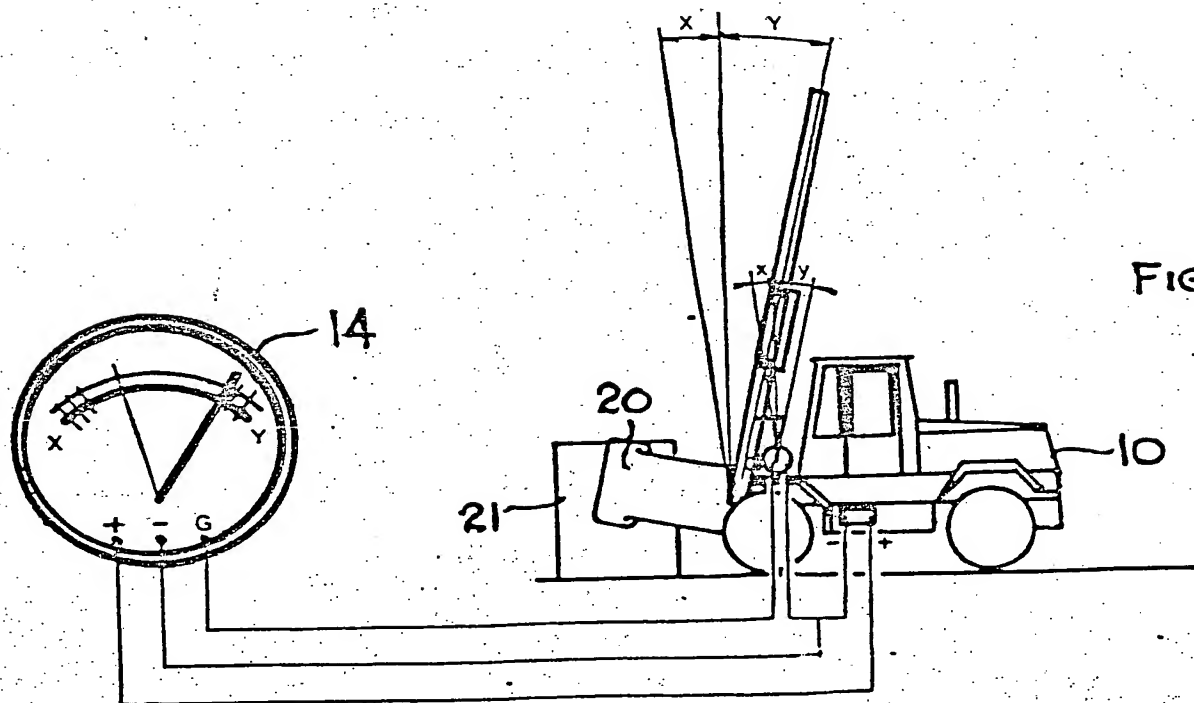
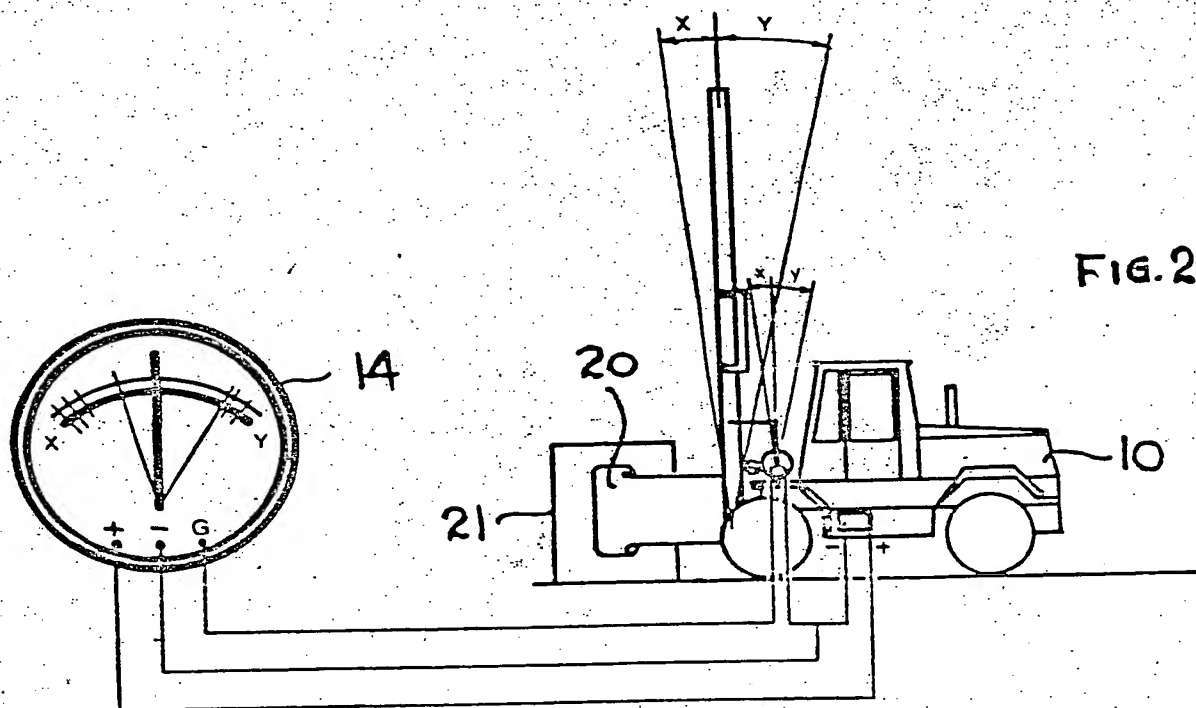


Claims

1. Indicator for the inclination of gripping means on loading trucks, said gripping means being vertically adjustable and also adjustable to an arbitrary angle of inclination in relation to the truck, characterized in that  
5 the indicator is electronic and comprises a sensor (13) adapted to continuously register the angular position of the gripping means (11,20) in relation to the truck, a gauge (14) connected to said sensor and having a pointer adapted to continuously follow the position indicated by the sensor,  
10 the gauge (14) further having a dial mark indicating the position which corresponds to the position of the gripping means (11,20) parallel to the plane defined by the contact surfaces of the wheels, the gauge being visible from the driver's seat.
- 15 2. Indicator as defined in claim 1, characterized in that the gripping means are a fork (11).
3. Indicator as defined in claim 1, characterized in that the gripping means are a clamping device (20).
4. Indicator as defined in any of the preceding claims,  
20 characterized in that the sensor (13) is a potentiometer.

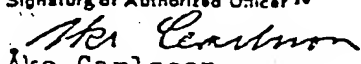






# INTERNATIONAL SEARCH REPORT

International Application No PCT/SE78/00085

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) <sup>3</sup> According to International Patent Classification (IPC) or to both National Classification and IPC		
B 66 F 9/24, G 01 C 9/00		
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched <sup>4</sup>		
Classification System	Classification Symbols	
IPC	B 66 F 9/00, 9/06-9/24; G 01 C 9/00-9/16      .../...	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched <sup>5</sup>		
SE, NO, DK, FI classes as above		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> <sup>14</sup>		
Category <sup>6</sup>	Citation of Document, <sup>15</sup> with indication, where appropriate, of the relevant passages <sup>17</sup>	Relevant to Claim No. <sup>18</sup>
X	GB, A, 1491345 published 1977, Nov 9, Claim 1, Towmotor Corporation	1, 3 - 5
A	SE, B, 371 173 published 1974, Nov 11, page 8 lines 31 - 37, Massey-Ferguson Inc	7
X	GB, A, 1258081 published 1971, Dec 22, claim 1, Westinghouse Brake and Signal Company Ltd	1
A	SE, B, 334 752 published 1971, May 3, claim 1, AB Bolinder-Munktell	1
A	US, A, 2972194 published 1961, Feb 21, column 3, Raymond E Ewing	1
A	US, A, 3984918 published 1976, Oct 12, fig 3 - 5, Preston E Chaney	1
<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><sup>9</sup> Special categories of cited documents: <sup>16</sup></p> <p>"A" document defining the general state of the art</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document cited for special reason other than those referred to in the other categories</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> </div> <div style="width: 45%;"> <p>"P" document published prior to the international filing date but on or after the priority date claimed</p> <p>"T" later document published on or after the international filing date or priority date and not in conflict with the application, but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search <sup>3</sup>		Date of Mailing of this International Search Report <sup>3</sup>
1979-02-12		1979-02-15
International Searching Authority <sup>1</sup>		Signature of Authorized Officer <sup>19</sup>
Swedish Patent Office		 Åke Carlsson

## FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

## II Continuation classification system.

Deutsche Klassen: 42c:24/04, 25/01

US classification: 33:365, 366

V ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE <sup>10</sup>

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. ☐ Claim numbers \_\_\_\_\_, because they relate to subject matter <sup>12</sup> not required to be searched by this Authority, namely:2. ☐ Claim numbers \_\_\_\_\_, because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out <sup>13</sup>, specifically:VI ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING <sup>11</sup>

This International Searching Authority found multiple inventions in this international application as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

## Remark on Protest

- ☐ The additional search fees were accompanied by applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.